NBER WORKING PAPERS SERIES

FISCAL FEDERALISM AND OPTIMUM CURRENCY AREAS: EVIDENCE FOR EUROPE FROM THE UNITED STATES

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Working Paper No. 3855

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 1991

First Draft: July 1989; this draft: September 1991. We would like to thank Robert Barro, Willem Buiter, Barca Campió, Behzad Diba, Alberto Giovaninni, and participants at the CEPR/CGES/IMF conference "Establishing a Central Bank for Europe" at Georgetown University for helpful comments on this and/or on an earlier version that circulated with the name "Federal Fiscal Policy and Optimum Currency Areas: Lessons for Europe from the United States." This paper is part of NBER's research program in International Studies. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

The main goal of this paper is to estimate to what extent the federal government of the United States insures member states against regional income shocks. We find that a one dollar reduction in a region's per capita personal income triggers a decrease in federal taxes of about 34 cents and an increase in federal transfers of about 6 cents. Hence, the final reduction in disposable per capita income is on the order of 60 cents. That is, between one third and one half of the initial shock is absorbed by the federal government.

The much larger reaction of taxes than transfers to these regional imbalances reflects the fact that the main mechanism at work is the federal income tax system which in turn means that the stabilization process is automatic rather than specifically designed each time there is a cyclical movement in income.

Some economists may want to argue that this regional insurance scheme provided by the federal government is an important reason why the system of fixed exchange rates that exists within the United States today has survived without major problems. Under this view, the creation of a European Central Bank that issues unified european currency without the simultaneous introduction (or expansion) of a fiscal federalist system could put the project at risk.

Rough calculations of the impact of the existing european tax system on regional income suggests that a one dollar shock to regional GDP will reduce tax payments to the EEC government by half a cent!. Hence, the current European tax system has a long way to go before it reaches the 34 cents of the U.S. Federal Government.

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(1) INTRODUCTION

Some Background

The issue of the appropriate exchange rate (ER) system for Europe is now hotly debated. Yet the question of whether Europe should have a single currency is not new. It goes back to the very first debates surrounding European economic integration of the late 40's and the 50's[1]. From the very beginning people have asked what, in our opinion, is a central question: Why do ER problems seem not to exist within some subsets of countries or within a country with a diversity of regions (as, for instance, the United States), while they do exist in the world as a whole? Put differently, why has the "irrevocably fixed" ER system within the US functioned well, while the Gold Standard and the Bretton Woods systems collapsed?. Economists have phrased this question in the following way: what constitutes an optimum (or at least reasonably good) currency area?[2].

Different schools have answered this question differently. Classical economists argued that the key variable to exchange rate regimes is transactions costs. Because these transactions costs represent social losses, they should be minimized and the way to do it is to have a single worldwide currency. Thus the entire world is an optimum currency area. J. S. Mill puts it in a very illustrative way:

"...So much of barbarism, however, still remains in the transactions of most civilized nations, that almost all independent countries choose to assert their nationality by having, to their own inconvenience and that of their neighbors, a peculiar currency of their own."[3]

Of course, in order to explain the existence of different currencies Mill had to claim a kind of "barbarism", a view that is not shared by many of his XXth century followers. The New Classical economists claim that one has to weigh the costs of having heterogeneous currencies with the benefits of being of each country being able to achieve its own optimal rate of money growth. Because they view the process of money supply as essentially a tax on existing money holdings, they see no reason why money growth (or inflation) should not be viewed within the problem of optimal taxation for each country. Hence, they explain the existence of different currencies according to structural differences across countries that lead to different optimal tax rates. For instance, it has been argued that the private technology for evading income taxes in Italy is superior to the one in Germany so the optimal inflation tax in Italy may be larger than in Germany. Thus the two countries should enjoy different currencies. See for instance Canzoneri and Rogers (1990).

Another view, associated with Monetarist and Keynesian economists puts the money supply process (and therefore the exchange rate regime) in the context of stabilization policies. Mundell (1961)argued that only regions within which there is relatively high labor mobility should have a unique currency[4]. His (now canonical) example is the following: suppose we have two regions (A and B), each producing one good (a and b respectively) and populated by households who consume a little bit of both goods so that there is interregional trade. Suppose that, starting from a full employment equilibrium position, there is a permanent shift of preferences from good a to good b (ie, at initial relative prices, everybody prefers relatively more of good b and less a). If the relative price between the two goods (the real ER) does not change, there will be a trade imbalance (a deficit for A and a surplus for B). Equilibrium can be restored at the initial relative price by changing the supplied quantities of both a and b. This can be achieved by moving people from region A to region B.

Yet another way to restore equilibrium is by changing the relative price and maintaining the initial quantities. In turn, this can be done through two different channels: the first one involves changing the nominal exchange rate and leaving the nominal prices in the two regions unchanged. This possibility is not present, however, when both regions have the same currency. The second way of moving the real ER is to change the nominal prices levels. In the case we are considering, the price level in A has to go down relative to the one in B. If prices and wages adjust immediately, the real ER jumps to the new equilibrium level and that is the end of the story. But the economists that support these stories believe that price levels are "sticky" (possibly due to small menu costs). In this case, the new equilibrium real ER will slowly be reached but only after a period of "over employment" in B and deflation and unemployment in A[5]. The longer it takes the nominal prices to adjust, the more severe will be the recession in A. Hence, according to this view, if labor is not highly mobile, A and B should have flexible ER so the monetary authorities can stabilize the two regions' output through independent monetary policies[6]. Thus, as mentioned earlier, this view holds that only regions within which there is high labor mobility should have flexible exchange rate systems.

Should Europe have a unique currency?. The Keynesian answer, according to what we just have seen, depends importantly on whether the EEC is strongly affected by the type of "real" shocks we just described or rather by "monetary shocks" like changes in the demand for money[7]. If we conclude that real shocks are important, then we have to analyze factor mobility among regions (or sectors). The 1992 liberalization will abolish all major constraints in labor mobility so in principle there seems to be a good reason to substitute all individual currencies for a single one. But there are barriers other (and perhaps more important) than the legal ones. Europeans have very different cultures and languages, as well as important and well known imperfections in housing markets that stifle mobility even within countries, not to mention between countries. These barriers will still exist after 1992. Hence, under this Keynesian view, if Europe decides to have a common currency, interregional shocks will generate unemployment in some regions and inflation in some others. The very survival of the monetary union (and, with it, the political and other forms of unification) could be threatened[8].

But let us imagine that, for whatever reason, Europeans go ahead and fix their exchange rates forever by creating a unique european currency. What can be done to minimize the possibility of collapse?. This can be answered by analyzing the regions of the United States. One could think of the U.S. as a collection of regions or states linked by a system of irrevocably fixed exchange rates. And one can argue that this system has worked reasonably well over the last couple hundred years. The question is what did it take?.

The first thing to understand is that, even though one might be tempted to think that there are no major interregional shocks requiring large changes in the real exchange rate across regions of the U.S., this is simply not true. What is true is that, because there are no current account data, policymakers and journalists do not associate these situations with open economy problems that require large real exchange rate movements. The second point is that, contrary to most people's beliefs, labor mobility across the United States is fairly limited. In a related study Barro and Sala-i-Martin (1991a) found that, *caeteris paribus*, an increase in a state per capita personal income by 1% raises net in-migration only by enough to raise the state's population growth rate by .026% per year. This slow adjustment through net migration means that population densities do not adjust rapidly to differences in per capita income adjusted for amenities.

Fiscal Federalism and Exchange Rates

It has been argued that one of the reasons why the U.S. exchange rate system has held up reasonably well is the existence of a "Federal Fiscal Authority" which insures states against regional shocks[9]. In addition to the mechanisms already mentioned (devaluation, labor movements or recession), there is another way of maintaining a fixed parity without major real imbalances: having a redistribution of income from "adversely shocked" to "favorably shocked" regions[10]. After a permanent taste shock like the one proposed by Mundell, we can be closer to full employment without changing the nominal ER or the nominal prices if we tax region B sufficiently and give the proceeds to region A (or reduce tax in A). This will, under some reasonable assumptions about relative demands increase demand for good "a" and reduce demand for "b" at the initial relative prices. The tax and transfer policy will mitigate (although not completely eliminate) the initial regional imbalance.

We should note at this point that this interregional public insurance scheme does not even need to be "conscious": a **proportional income tax** even if accompanied by acyclical expenditures and transfers will automatically work as a tax/transfer system that helps to defend fixed ER parities. Even better, if (as we will see it is the case in the United States) the income tax is progressive and the transfer system is countercyclical, the fraction of the shocks insured by the fiscal system will be even larger.

In addition to this automatic insurance scheme, the Federal government could have other tools in order to be able to stabilize large nonstationary shocks such as the S&L crises in the United States or the German unification shock in Europe.

There is set of questions that immediately comes to mind:

(i) Couldn't the regional government stabilize output by running countercyclical deficits?

Regional governments (e.g. states within the United States) could try to stabilize regional income by themselves, running budget deficits during regional recessions and surpluses during booms, but such a policy is likely to be much less effective than a federal arrangement. The problem with regional fiscal policy is that budget deficits have to be repaid by higher taxes or lower spending **by the same region** at some point in the future. Short-term gains in stabilization may be lost in the future, or even worse, short-run stabilization could be frustrated by Ricardian equivalence if the future taxes are incorporated into consumers' budget constraints. This Ricardian equivalence does not, however, frustrate stabilization when the fiscal policy is carried out by a federal authority, because in that case, the federal arrangement explicitly **redistributes** the intertemporal tax and spending patterns across regions according to the shocks hitting the regional economies. Lower taxes paid by a region in recession are NOT matched in present value terms by higher future taxes paid by the same region, but rather by higher taxes paid by all regions in the federal area.

Another reason why state and regional governments cannot really smooth income with countercyclical deficits is that, to the extent that factors of production are mobile, they may tend to remain in the state while taxes are low and leave when taxes increase. In other words, when regional governments run large deficits, firms and workers expect future tax increases. Of course that means that they will both tend to leave the region at the time of the tax increases, which will reduce the regional government tax base. Because state governments may fear this reaction, they will choose not to run large state deficits, which substantially reduces the potential role for income smoothing regional deficits. Recent history shows that regional governments (both in the United States and in Europe) may already be in financial trouble, so further deficits seem like infeasible strategies at this point (see the paper by Goldstein and Woglom in this volume for evidence on this issue).

(ii) Isn't this insurance scheme infeasible in Europe because the richer countries are already complaining about more redistributional policies to help the South?.

No. This paper does not ask whether the Federal Fiscal System actually promotes long run income equality[11]. One may want to argue that a Federal Government is needed to reduce long run income inequalities through taxes and transfers. But this is not the purpose of the present study and our findings have nothing to do with whether the federal government has other programs to reduce the long run dispersion of per capita income. In other words, **in the federal insurance scheme, the rich countries would not have to pay more than the poor countries.**

As an example, let us imagine two countries: R (rich) and P (poor) who decide to create a federal union. Imagine that the rich country has an income of 1000 Ecus and the poor has an income of 500 Ecus. Suppose that they decide to pay an income tax of 10% to the central government. The government will from then on give a transfer of 100Ecus a year to R and a transfer of 50Ecus to P. Note that in the first year there are no net transfers so this program is not designed to redistribute income from Rich to Poor.

Let us imagine that during the following year R suffers an adverse shock that reduces its income by 100Ecus while P sees its income increased by 100Ecus. The taxes paid to the Federal Government would still be 10% of income so R would pay 90Ecus and P 60Ecus. The transfers received from the central government would still be 100 and 50Ecus respectively. In effect, therefore, there would be a transfer from R to P by the amount of 10Ecus. In other words, the Federal insurance scheme redistributes income **from the country that suffers a favorable shock to the country that suffers an adverse shock, regardless of whether they happen to be Rich or Poor!**. In particular, it is independent of any other programs the federal governments may want to implement in order to reduce income inequality in the long run.

(iii) Couldn't private insurance markets do the same job?

In principle it is true that an auto worker in Detroit can write a contract with an economics professor in Massachusetts that insures eachother's wage against interregional shocks. The problem with this argument is that, due to the practical difficulties in monitoring the wages from people living thousands of miles away, these type of contracts are subject to moral hazard and adverse selection problems that will in practice prevent them from existing[12]. It is shown in Sala-i-Martin (1990) that state GDP and GNP behave very similarly over the periods for which both data are available (which includes the sample considered in the empirical section of this paper). If these contracts were important, the behavior of GDP and GNP would be very different.

The main goal of this paper is to find out empirically how important is this insurance role of the Federal Fiscal system across the United States' regions. The rest of the paper is organized as follows. In section 2 we highlight the empirical method used. In section 3 we describe the data. In section 4 we report the main empirical results. In section 5 we quantify the importance of the empirical findings. The last section concludes.

(2) BASIC METHOD

Our goal is to find by how many cents the disposable income of region i falls when there is a one dollar adverse shock to that region's income, and when the region belongs to a federal fiscal union. That is we want to see

$$(2.1)\quad \Delta YD = \Delta Y + \Delta TR - \Delta TX$$

where disposable income - YD - is defined as the sum of GDP - Y - plus transfers from a federal government - TR -, minus taxes paid to that federal government - TX -, with all of the variables to be thought of as discounted present values (note that ΔY in (2.1) involves only current output however):

Suppose that the tax and transfer system works so that each 1 percent increase in Y produces a β_{TX} percent increase in taxes to the federal government, and a β_{TR} percent decrease in transfers to the federal government. In other words,

$$(2.2)\quad \beta_{TX} = \frac{\Delta TX/TX}{\Delta Y/Y} \quad \text{and} \quad \beta_{TR} = \frac{\Delta TR/TR}{\Delta Y/Y}$$

Then, combining (2.1) and (2.2) we have that

$$(2.3)\quad \Delta YD = \Delta Y^{*}\lambda$$

where $\lambda = (1 - \beta_{TX}{*}TX/Y - \beta_{TR}{*}TR/Y)$. Procyclical taxes ($\beta_{TX}>0$) and countercyclical transfers ($\beta_{TR}<0$) stabilize disposable income in the face of external shocks.

Our empirical strategy will be to estimate the two key elasticities β_{TX} and β_{TR} using United States' state or regional data. The U.S. is a good laboratory because it consists of several economically distinct regions, linked together by a Federal Government and using an "irrevocably fixed ER system". We will divide the United States into nine census regions and try to estimate their federal tax and transfers elasticities (ie their β_{TX} and β_{TR} coefficients). We choose the nine census regions for two convenient reasons. First, the size of the individual regions is then similar to the average size of a member of the European Community. Second, the division we choose is made by the Bureau of the Census to define census region. Thus, we cannot be accused of constructing the regions so as to fit the data better. One could argue that an even more natural unit is the "state" because states have independent fiscal units (state governments). This is true but since the ultimate goal of this paper is to apply the results to the European community, the U.S. map with fifty states would look too different from the European one[13]. The Regions (as defined by the Bureau of the Census) are described in Table 1. To calculate the coefficients β_{TX} and β_{TR}, we will think about the following empirical implementation (which builds on Sala-i-Martin (1990), Chapter 4):

$$(2.4)\quad \ln(TAX_i) = \alpha_{TX} + \beta_{TX}\ln(INCOME_i) + \gamma_{TX}TIME + u_i$$
$$(2.5)\quad \ln(TRANSFER_i) = \alpha_{TR} + \beta_{TR}\ln(INCOME_i) + \gamma_{TR}TIME + \epsilon_i$$

where TAX refers to real tax revenue per capita, INCOME is real income per capita and TRANSFER is real value of transfers per capita. The TIME variable reflects upward/downward trends in relative taxes that are not explained by the relative variations in income. Long term movements in stuff which is not cyclically correlated with relative income.

The straight implementation of this two equations involves at least three problems. First, we may encounter simultaneity biases. Since higher taxes may depress regional economic activity, simple least squares estimates of equation (2.4) will have a downward bias. If we think of taxes as being lump sum, an increase in Federal taxes will reduce disposable income and, therefore, aggregate expenditure and output. We should mention here that this is true even if Ricardian Equivalence in the Barro (1974) sense holds. This is true because people in region A may think that the higher tax rates they are paying now may be used to finance lower taxes in some other regions either now or in the future. Hence, their current human wealth falls with tax increases. Of course we could think of this as being the "space dimension version" of Blanchard (1985): in his model, people think they can shift taxes to future yet unborn generations for which they do not really care about. Here agents think they can shift taxes to people of other regions for which they do not really care about either. The discount rates that Blanchard interprets as probability of death can be interpreted here as the "probability of my taxes being paid by the people of some other state". If, more realistically, taxes are distortionary rather than lump sum, there will be additional negative effects on income of a rise in taxes, such as the disincentive of labor supply and investment.

The same type of arguments apply to transfers. Suppose that a decline in activity leads to a rise in transfers, through countercyclical spending programs such as unemployment insurance. If we try to estimate this negative relationship between economic activity and transfers, the estimated coefficient on economic activity will tend to be biased towards zero, since higher lump sum federal transfers will *caeteris paribus* tend to increase disposable income and consumption and therefore increase activity in the region. We will try to solve this simultaneity problem by instrumental variables estimation.

The second problem we may encounter is that of endogenous U.S. budget deficits. One can argue that when the overall U.S. suffers a recession, the Federal Government runs a deficit (maybe because optimal tax rates are smooth). If tax rates remain constant and transfers increase or remain constant, the federal government absorbs some of the initial shock. Barro (1979) finds that a one dollar shock to U.S. income generates an increase in the federal deficit of about 1.8 dollars. In order to make sure that we are not picking up these Federal Deficit effects, we want to see how the Federal taxes and transfers for a specific region change when the region's income changes by 1% relative to the rest of the nation. That is, we will estimate changes in regional taxes and transfers holding the overall US GNP, taxes and transfers constant. The two modified equations will therefore be the following:

$$(2.4)' \ \ln(\text{RELATIVE TAX}_i) = \alpha_{TX} + \beta_{TX} \ln(\text{RELATIVE INCOME}_i) + \gamma_{TX}\text{TIME} + u_i$$

$$(2.5)' \ \ln(\text{REL. TRANSFER}_i) = \alpha_{TR} + \beta_{TR} \ln(\text{RELAT. INCOME}_i) + \gamma_{TR}\text{TIME} + \epsilon_i$$

where relative X refers to the ratio of state i's X to the overall U.S. value of X (where X is either tax revenue, transfers or personal income). Since the relevant variables are now in relative terms, the coefficients β_{TX} and β_{TR} tell us by what percentage the region's taxes and transfers change (relative to the rest of the country federal taxes and transfers) when its income changes by 1% holding constant the changes in U.S. aggregate income.

The third empirical problem we have to deal with involves the error terms. Even though we will start by estimating (2.4)' and (2.5)' with standard ordinary least squares, there is no a priori reason to assume that the error terms are homoscedastic or that they are uncorrelated across regions. Therefore we will estimate the systems of equations allowing for correlation across equations and also allowing for the regional shocks to have different variances in different regions.

(3) DATA

The data we use are available by state. We aggregate them according to the Bureau of the Census regional definitions which are reported in Table 1. The personal income data are net of transfers or taxes and are taken from the Survey of Current Business (SCB). To calculate income per capita we use the population data reported by the SCB.

The lack of a regional or state consumer price index forces us to deflate regional variables by the overall U.S. CPI. This could potentially be a problem if there were large regional prices movements. Of course we know that the relative prices will not change in response to nominal or monetary shocks. We tend to think, however, that the response to real shocks (such as productivity changes or consumer preferences shifts) involve changes in relative prices. Internal migration could also have effects on relative prices mostly through changes in the prices of nontradeables (the most important item of which is probably housing). Given that the data, to the best of our knowledge, do not exist, the best we can do for now is to use aggregate U.S. price data (consumer price index) and hope that these errors are not very large. Sala-i-Martin (1990, Chapter 3) uses city price data for over 30 SMAS to show that these errors are probably very small since the largest inflation differential between any two cities is almost 9% over the last 60 years (which corresponds to an annual inflation differential of about .14%).

Thus, regional nominal income per capita is deflated by U.S. CPI to create real income per capita. The relative real income per capita data is the ratio of a region's real income per capita to the overall U.S. real income per capita.

The tax variable includes Personal Tax and Non Tax payments to the Federal government as reported by the SCB (which includes individual and fiduciary income taxes, estate and gift taxes and nonpayment taxes) plus contributions to social insurance. Of course these are not all the taxes collected by the Federal Government: in particular we are missing corporate taxes (which, if include Federal Reserve Banks, amounted about 10% of total federal receipts in 1986) and indirect taxes and customs duties (which amounted about 6% of total federal receipts in 1986). The reason why we are omitting these tax receipts is that the data are not available at a state level (The Tax Foundation in Washington started collecting these kind of data in 1981 so we could not find state-disaggregated federal tax receipts before that date). Since we are missing only 17% of the total, we think that our estimates would not change much if the missing taxes were included[14].

We deflate the tax data with the U.S. CPI and we divide by population to calculate real federal tax payments per capita. Again we divide the regional variable by the U.S. variable to get relative real federal tax payments per capita.

Total nominal transfers from the Federal Government to the State (or region). It is the sum of direct transfers to individuals (as reported by the SCB) plus Federal transfers to State and Local governments. The direct transfer payments to individuals include social security and other retirement plans, income maintenance payments (food stamps, supplementary secondary income for aged and disabled and others), veteran benefits payments and payments to nonprofit institutions. Notice that unemployment benefits are not directly included here since unemployment programs are not run by the Federal but, rather, by the state governments (although they are indirectly included there to the extent that the Federal Government increases its transfers to the State Government when the state suffers high unemployment). The reason we include Transfers to State and Local governments is that Federal help to region A after a negative shock may involve direct transfers to state and local governments which then either decrease taxes or increase transfers to the private sector (as is the case with unemployment benefits).

A more comprehensive measure of "federal fiscal help" would include government purchases and project awards. We do not include them in our study for two reasons. First, we did not find time series data on Federal purchases by state long enough to match our sample. The Tax Foundation collects these data since 1981. But the data do not exist before then. Second, these data correspond to "contracts" not to actual expenditure: The final site of the supercollider will be Texas but this does not mean that all the money will be spent there. Scientists from Massachusetts, workers from Seattle and financial lizards from New York could very well benefit from the money awarded to Texas. Hence, for our purposes, these data are not that useful after all.

There are also other kinds of important transfer payments that are not included in our study up to this point. The federal government transfers involved in shutting down the failed savings and loan institutions would not be picked up the categories of transfer payments we are using, and yet the size of the transfers involved are very large. As an illustration, as of mid-1988, there were 127 FSLIC-insured thrift institutions in Texas with a negative net worth (according to so-called GAAP accounting rules). These institutions had a combined negative net worth of about $151 billion, or about 60 percent of the state's GNP! If Texas were an independent country, these bank failures would produce an extreme financial crisis that would cripple the Texas economy, a large decline in net wealth, and perhaps a significant external debt crisis, to the extent that deposits in the failed institutions were from outside of Texas. Instead, the crisis will produce, at much lower cost, an enormous transfer of income to Texas from the rest of the United States.

We will deflate the transfer data with the U.S. CPI and we will divide by population to calculate real federal transfer receipts per capita. Again we will divide the regional variable by the U.S. variable to get relative real federal transfer receipts per capita.

(4) ESTIMATION

Instruments Regressions.

As mentioned earlier, the systems (2.4)' and (2.5)' are subject to simultaneity bias problems. To solve this potential problem we will try to find instruments. Candidates for instruments are aggregate variables that may affect different regions in different ways due to the different production structures, etc.

Our list of proposed instruments includes the real price of oil (ROILP), US aggregate GNP growth (DGNP), and the real value of the US DOLLAR. Since regions differ markedly in their natural endowments and product specialization, one may think that changes in the relative price of oil will affects regions differently. The aggregate growth variable is included on the grounds that different regions will have industrial mixes with different sensitivities to economy-wide business cycle conditions (e.g. services are less cyclical than heavy industry). The real value of the dollar vis-a-vis a basket of foreign currencies is included because different regions have a different mix of tradeables versus nontradeables, and thus will be differentially affected by the extent to which the dollar fluctuates in value versus foreign currencies. There is no good reason to think that these aggregate shocks affect **relative** taxes and transfers through some channel other than relative income changes. So, in principle, they should be good instruments so long as they are correlated with initial income.

In Table 2 we show how well these proposed instruments correlate with relative income. We see that the regressions are highly successful for 8 out of the 9 regions. The exception is the Pacific region (PAC) with an adjusted R^2 coefficient of about .35. The other regions' R^2 range from .65 in WNC to .92 in ENC. We can reject the hypothesis that all coefficients are zero for all regions at a 1% significance level (5% for PAC).

Some of the partial correlations in Table 2 are interesting. We observe that relative income for NENG is significantly positively correlated with the real value of the dollar (DOLLAR) and negatively correlated with the real price of oil (ROILP), which reflects the negative wealth effect mentioned above. We also see that when the U.S. grows faster, New England's relative income goes down. The Middle Atlantic region is very similar to NENG. It does very well when the dollar is strong and relatively poorly when oil prices rise. MATL also does poorly when the US as a whole grows faster. The long run trend in its relative income is positive.

South Atlantic's relative income is also positively correlated with the DOLLAR and negatively correlated with ROILP and DGNP. This later variable, however, is not significant. The long run trend is positive. East North Central is a very interesting region. Its relative income is very negatively correlated with the DOLLAR and the ROILP. This region is a major producer of industrial goods (cars) and it is hurt by foreign imports when the dollar is strong. It is also hurt by higher oil prices (as oil is a complementary good for cars). Different from all the above regions, ENC does relatively well when the US as a whole grows faster. The long run trend is negative.

East South Central's relative income seems not to be affected by the real oil price (its coefficient is negative but insignificant). This region is hurt in relative terms by a strong dollar and by a weak US growth. Its Long Run trend is significantly negative. West North Central presents a negative trend and significant relative correlation with the dollar. Its income barely moves when the US GNP growth or the oil price change. West South Central income is very strongly and positively correlated with the real oil price. Given that the states in this region are major producers of oil, this is not surprising. Even though none of the other instruments is significant the remarkable fit (R^2 of .79) shows that this region's relative income is largely determined by oil prices.

The Mountain region is also very positively correlated with oil (some of its states - such as Wyoming - are also major oil producers). The negative correlation between its relative income and the real value of the DOLLAR is significant at the 8% level. Finally, the Pacific region is really disappointing. The adjusted R^2 is really low and none of the variables is significant. We have tried to eliminate the smaller states (in particular Alaska and Hawaii) but the problem does not seem to come from any of them, but rather, from California. If instead of relative income we regress relative taxes on relative unemployment rates, the coefficients for PAC are very similar to the other regions. This leads us to think that there could be some problem with the Californian income data. In the absence of further work, we should look at the Pacific results with some skepticism.

Relative Taxes Equations.

We can now proceed to estimate the relative tax and transfers equations (2.4)' and (2.5)'. The results for the tax equations are displayed in Table 3. Each regression has been estimated by three different methods. Columns one and two refer to simple OLS estimates. The first column shows the β_{TX} coefficient and its standard error (the constant and time trend which have been included in the regression are not reported separately[15]). The second column reports the adjusted R^2 and standard error of the regression. Hence, the OLS estimate of β_{TX} for New England is 1.275 (s.e.=.0539) the R^2 is .98 and the standard error of the regression is .009.

Note that the coefficients for the relative income variable -β_{TX}- reported in Table 3 fluctuates around 1.35[16]. The largest OLS estimate corresponds to the South Atlantic (SATL) region -β_{TX}=1.738 (s.e.=.146)- and the smallest is the Rocky Mountains with -β_{TX}=1.254 (s.e.=.1566). Similar numbers apply for the I.V. and S.U.R. estimates.

The coefficients reported in columns 3 and 4 refer to the Instrumental Variables regressions. As we argued previously, the reason for using this method is the possible existence of simultaneity bias since higher relative tax rates may reduce relative regional income. Notice that the estimates of β_{TX} are very similar to ones reported for OLS regressions.

Finally in columns 5 and 6 we allow for the regional shocks to relative taxes u_i to be correlated across regions. In order to allow for that we estimate all the regions at the same time in a seemingly unrelated regression estimation system (S.U.R.). Again the estimates are not very different from the OLS ones, suggesting that the correlation of error terms across equations may not be that important.

We are now interested in testing the hypothesis of similar β_{TX} coefficients across regions. If, as we have conjectured, the elasticity coefficient β_{TX} reflects mostly the progressivity of the Federal Tax System, we should expect these coefficients to be constant across regions. In the last six rows of Table 3 we report the β_{TX} coefficients when all regions are constrained to be equal. We constrained OLS coefficient is 1.333 (s.e.=.0277). The test for equality of β_{TX} coefficients across regions can barely be rejected at the 5% level (p-value=.044). The restricted IV coefficient is 1.361 (s.e.=.0321) and the test for equality across regions cannot be rejected at the 5% level (p-value=.076). The constrained S.U.R. coefficient is 1.335 (s.e.=.0233) and the test for equality across regions cannot be rejected at the 5% level (p-value=.177).

The last three rows of Table 3 report the restricted β_{TX} coefficients when we estimate the system of regions correcting for heteroscedasticity. The weighting method employed gives more weight to the regions whose standard error of the regression (which is reported in Table 3) is smaller. Note that constrained weighted OLS coefficient is 1.275 (s.e.=.0492) and p-value .05, the constrained Weighted I.V. β_{TX} coefficient is 1.360 (s.e.=.0318), and the constrained weighted S.U.R. coefficient is 1.335 (s.e.=.0233). We also estimated unconstrained weighted systems which allows us to test the hypothesis of equality of the β_{TX} coefficients across regions. We find that we cannot reject the hypothesis of regional equality at the 5% level in any of the three cases.

In summary, the estimated β_{TX} coefficient fluctuates around 1.35 and we cannot reject the hypothesis that they are equal across regions. This implies that, holding constant the aggregate US variables and adjusting for whatever factors affect the long-run movements in regional taxes, a 1 percent increase in a region's income increases its federal tax payments by 1.35 percent (statistically significantly larger than one). Since there is no "intentional" reduction in tax rates when a region suffers an adverse shock, these findings just reflect the progressive nature of the US tax system.

A simple numerical example will further clarify what the numbers found mean. Consider an economy with an average tax rate of 20% (the average tax rate for our U.S. regions can be calculated to be around 20% from Table 5). Suppose further that the average marginal tax rate is about 30%[17]. The β_{TX} coefficient for this economy (which the ratio of marginal to average tax rates) would be exactly 1.5. If the average marginal tax rate were 27%, the β_{TX} coefficient would be 1.35. Hence, our estimates are exactly in the ball park.

Relative Transfers Equations.

The picture for transfers (Table 4) is a bit different. We expected to observe a negative coefficient reflecting the fact that, holding constant US aggregate variables, an increase in regional income would reduce the transfers received from the federal government. The O.L.S. estimates show that, out of nine regions, six are significantly negative, one significantly positive (MATL) and two are not statistically significantly different from zero (one positive point estimate corresponding to ESC, and one negative, corresponding to WSC). The Restricted OLS estimate is -.181 (s.e.=.0409) but the equality of β_{TR} coefficients across regions can be rejected at the 5% level (p-value=.000). The instrumental variables estimates reported in columns three and four are very similar to the OLS ones (which reflects the fact that we are estimating the relative income regressions in Table 2 with high precision). The restricted estimate is -.171 (s.e.=.0458) and can be rejected to be equal across regions at the 5% level (p-value=.000).

The results corresponding to the S.U.R. system are reported in columns 5 and 6 of Table 4. The restricted S.U.R. estimate is a bit higher than the OLS one although not significantly so (β_{TR}=-.192 (s.e.=.0217)).

The results for the weighted restricted systems are reported in the last three rows of Table 4. The weighted OLS estimate is -.327 (s.e.=.0424). This point estimate is just a weighted average of the OLS estimates above, where the weights are the standard errors of the OLS equations. Notice that, because the regions with positive OLS β_{TR} estimate have relatively high standard errors, the restricted weighted OLS estimate is higher than the unweighted one (where all regions receive the same weight).

Something similar happens with the IV regressions. Because the regions that had positive IV estimates had high standard errors, the weighted estimate is much higher than the unweighted one.

Finally, the results for the weighted SUR system are surprising. When we estimated the unconstrained weighted system (not reported in the Table)[18] we found that ALL the point estimates where negative and significant!. The constrained estimate is -.226 (s.e.=.021) and the equality across regions cannot be rejected the 5% level (p-value=.1). The better estimates of β_{TR} when we use a weighted S.U.R. system is probably due to the cross equation interaction of error terms being relatively important for the transfers equations.

Summarizing, the relative transfer coefficients $-\beta_{TR}-$ for a system of nine U.S. regions display some instability if they are estimated giving equal weight to all regions. If we correct for heteroscedasticity, however, the coefficients are much more stable. The restricted unweighted numbers fluctuate around -.20 while the restricted weighted β's move around -.30. The apparent instability of the β_{TR} coefficients is not surprising since, unlike taxes, the federal transfer system in the U.S. is not really set as an automatic reaction to personal income.

(5) CALCULATING THE FEDERAL IMPACT ON DISPOSABLE INCOME.

The β coefficient estimated in Section 4 tell us by what percentage the relative taxes and transfers of region i increase when there is a one percent increase in that region's relative income. Looking back to equation (2.1), we want to ask now, how many cents the federal government actually absorbs when there is a one dollar shock to the relative per capita income of a region. To do so we can evaluate the estimated elasticities at the average income, tax and transfers. When average income in region i increases by one dollar, the average tax payment increase by $\lambda_{TX}=\beta_{TXi}*TX_i/Y_i$ and the average transfer falls by $\lambda_{TR}=\beta_{TR}*TR_i/Y_i$, where TX_i/Y_i is the average tax rate and TR_i/Y_i is the average transfer for that region. The final disposable income for region i increases by $\lambda=1-\lambda_{TX}+\lambda_{TR}$ cents after a one dollar shock to that region's income.

In Table 6 we use the estimated β coefficients from Tables 3 and 4 to calculate the corresponding λ's. The first few columns use the restricted estimates. The rows labeled OLS, IV, and SUR display the λ's corresponding to the restricted OLS, IV and SUR estimates of Tables 3 and 4. The rows labeled WOLS, WIV, and WSUR report the λ's corresponding to the restricted weighted OLS, IV, and SUR estimates of Tables 3 and 4. The numbers in parenthesis refer to the λ's that correspond to two standard deviations away from the point estimates of β. For instance, the restricted OLS numbers suggest that when a typical region in the U.S. suffers a one dollar adverse shock to its personal income, its average federal tax payments reduce by something between 33 and 35 cents (with a point estimate of 34 cents), its transfers increase by somewhere between 2 and 5 cents (with a point estimate of 3 cents) so that the disposable income falls by something between 59 and 65 cents (with a point estimate of 62 cents).

Notice that the results for λ_{TX} are very stable across Table 6 and they move between 34 and 37 cents to the dollar. This stability is due to the stability of the β_{TX} coefficients in Table 3. The results for λ_{TR} when we use the weighted estimates are a bit larger than the ones we get by using the unweighted ones: the unweighted λ_{TR} are in the neighborhood of -.03 while the weighted ones fluctuate around -.06. Correspondingly the unweighted overall λ's move around .62 for the unweighted estimates and around .60 for the weighted ones.

The second half of Table 6 shows the λ estimates for each of the nine regions. Notice that the estimated λ_{TX}'s are extremely stable (except for the Pacific region). This again is due to our earlier finding that the β_{TX} coefficients are very stable across regions. The average tax response to a dollar shock is 34 cents. The estimated λ_{TR} fluctuate a lot more across regions, and therefore, so do the overall λ's. The average transfer response to a dollar regional shock is 8 cents. The corresponding average TOTAL response to a dollar regional shock is 58 cents. Notice that these results are not very far from the ones we got using the restricted estimates.

Taken as a whole, Table 6 suggests that when the average region suffers a one dollar adverse shock to its personal income, its federal tax payments are reduced by something between 33 and 37 cents, the transfers received from the federal government increase by somewhere between one and eight cents so the final disposable income falls by only 56 to 65 cents. Hence, the fraction of the initial shock that is absorbed by the federal fiscal system is between one third and one half. Most of the action comes from the tax side which probably reflects the progressive nature of the U.S. Federal Tax system.

(6) FINAL REMARKS.

We have argued that the U.S. can be viewed as a set of regions tied by an "irrevocably fixed ER" and that this ER arrangement seems to work effectively. One of the reasons for this reasonably efficient system could be that the Fiscal Federalist system absorbs a substantial fraction of interregional shocks. This reduces the need for nominal exchange rate realignments.

The existence of this Federal Fiscal system does not mean that there are no interregional adjustments to be made but, rather, that they are made without devaluations (or major pressures on the one-to-one fixed parities) and without extraordinary recessions.

We tried to estimate empirically the effects of such a Fiscal Federalist system and we found that a one dollar reduction in a region's per capita income triggered a decrease in federal taxes in the neighborhood of 34 cents and an increase in federal transfers of about 6 cents. The final reduction in disposable per capita income was, therefore, of only 60 cents. That is, between one third and one half of the original one dollar shock is absorbed by the Federal Government.

The much larger reaction of taxes than transfers to these regional imbalances reflects that the main mechanism at work is the progressive federal income tax system which in turn reflects that the stabilization process is automatic rather than discretionary. Our estimates do not include the large one time transfers that occur when there are large one time disasters (such as the S&L crises and the huge transfers from the U.S. to the few states involved). Hence, we are underestimating the role of the Federal Government as a partial insurer against regional shocks.

Some economists may want to argue that this regional insurance scheme provided by the federal government is one of the key reasons why the system of fixed exchange rates within the United States has survived without major problems. And this is a lesson to be learnt by the proponents of a unified European currency: the creation of a unified currency without a federal insurance scheme, could very well lead the project to an eventual failure.

On the other hand, it could be (rightly) argued that Europe already has a Federal System of the type proposed here, insofar as there are European Community Taxes. Some simple calculations based on rough estimates show that this is close to negligible: the average VAT tax rate (as a ratio of GDP) for members of the EEC is of the order of .5%. Let us assume that the average and marginal tax rates are roughly similar (that is let us assume that tax rate is always constant). This would yield a β_{TX} equal to one. The corresponding λ_{TX} would then be about .005. That is, if a European Region or Country suffers a one dollar adverse shock, its tax payments to the European Community will be reduced by half a cent. This contrasts with the 34 cents we found for the United States. Thus, European Fiscal Federalism has a long

way to go.

TABLE 1 US CENSUS REGIONS

1) New England (NENG): CT, ME, MA, NH, RI and VT.
2) Middle Atlantic (MATL): NJ, NY and PA.
3) South Atlantic (SATL): DE, FL, GA, MD, NC, SC, VA and WV.
4) East North Central (ENC): IL, IN, MI, OH and WI.
5) East South Central (ESC): AL, KY, MS and TN.
6) West North Central (WNC): IA, KS, MN, MO, NE, ND and SD.
7) West South Central (WSC): AR, LA, OK and TX.
8) Mountains (MTN): AZ, CO, ID, MT, NV, NM, UT and WY.
9) Pacific (PAC): AK, CA, HI, OR and WA.

TABLE 2 INSTRUMENTS REGRESSIONS

RHS VARIABLES

REGIONS	C	TIME	DGNP	ROILP	DOLLAR	R^2BAR	F-stat
NENG	-.225 (-4.19)	.020 (10.5)	-.435 (-2.42)	-.002 (-2.97)	.00099 (5.49)	.90	42.5
MATL	-.078 (-2.33)	.009 (7.28)	-.373 (-3.34)	-.001 (-3.36)	.0007 (5.85)	.84	24.14
SATL	-.140 (-3.68)	.006 (4.53)	-.071 (-.60)	-.0008 (-2.17)	.0003 (2.26)	.65	9.01
ENC	.262 (8.91)	-.012 (-11.9)	.322 (3.29)	-.0008 (-2.42)	-.0007 (-7.22)	.93	54.22
ESC	-.13 (-5.70)	-.007 (-7.67)	.273 (3.43)	.00007 (0.26)	-.0006 (-7.21)	.82	20.38
WNC	.118 (2.88)	-.006 (-4.17)	.058 (.96)	-.000001 (-.34)	-.0006 (-3.83)	.66	9.21
WSC	-.219 (-2.72)	.0003 (.12)	.228 (.84)	.0047 (5.58)	.00002 (.08)	.79	17.15
MTN	-.027 (-.87)	-.005 (-4.62)	.150 (1.47)	.0017 (5.30)	-.0002 (-1.89)	.79	17.32
PAC	.134 (4.07)	-.001 (-.85)	-.020 (-.18)	.0005 (1.50)	.-.00012 (-1.15)	.37	3.35

Note: The dependent variable is per capita real income of each region relative to the US total. The variable TIME is a time dummy. DGNP is the growth rate of overall US GNP. ROILP is the oil price in real terms. Dollar is the real value of the US dollar (weighted average). The numbers in parenthesis are t-statistics. See Table 1 for regional definitions. Sample period 1970 to 1988.

TABLE 3: RELATIVE TAXES VERSUS RELATIVE INCOME

REGION	O.L.S.		I.V.		S.U.R.	
	β_{TX} (s.e.)	R^2 [s.e.]	β_{TX} (s.e.)	R^2 [s.e.]	β_{TX} (s.e.)	R^2 [s.e.]
NENG	1.275 (.0539)	(.98) [.0090]	1.280 (.0580)	(.98) [.0089]	1.233 (.0358)	(.98) [.0091]
MATL	1.391 (.0845)	(.95) [.0094]	1.434 (.0908)	(.95) [.0095]	1.324 (.0563)	(.95) [.0096]
SATL	1.738 (.1462)	(.89) [.0099]	1.693 (.1834)	(.89) [.0100]	1.688 (.1022)	(.89) [.0100]
ENC	1.370 (.0938)	(.97) [.0078]	1.403 (.1030)	(.97) [.0078]	1.501 (.0730)	(.96) [.0083]
ESC	1.379 (.1907)	(.78) [.0141]	1.336 (.2057)	(.78) [.0141]	1.355 (.1328)	(.78) [.0141]
WNC	1.591 (.2948)	(.62) [.0225]	1.694 (.3443)	(.62) [.0226]	1.658 (.2033)	(.62) [.0225]
WSC	1.323 (.0537)	(.98) [.0108]	1.375 (.0623)	(.98) [.0111]	1.292 (.0414)	(.98) [.0109]
MTN	1.254 (.1566)	(.80) [.0134]	1.260 (.1718)	(.80) [.0134]	1.174 (.1046)	(.80) [.0135]
PAC	.535 (.3315)	(.37) [.0166]	.261 (.5220)	(.34) [.0169]	.6152 (.1920)	(.36) [.0166]
RESTRICTED (1)	1.333 (.0277)	--	1.361 (.0321)	--	1.335 (.0233)	--
P-VALUE	.05		.08		.187	
RESTRICTED (2)	1.275 (.0492)	--	1.360 (.0318)	--	1.335 (.0233)	--
P-VALUE	.05		.08		.05	

Notes to Table 3: The left hand side of these regressions are the logs of real relative taxes described in the text. The Equations have been estimated with a time trend and a constant, not showed separately. The OLS estimates are reported in columns one and two. Each group of four numbers corresponds to the β_{TX} coefficient and its standard error, the adjusted R^2 and the standard error of the regression. The restricted (1) systems have been estimated with individual constants and time trends. The p-value corresponds to the test of equality of coefficients across regions. The likelihood ratio statistic follows a chi-square distribution with 8 degrees of freedom. The restricted (2) corrects for heteroscedasticity and allows each region to have its own variance of the error term. The middle two columns reproduce the OLS estimates using instruments reported in Table 2. The last two columns refer to Seemingly Unrelated regressions were the errors are allowed to be correlated across equations. The sample period is 1970-1988.

TABLE 4: RELATIVE TRANSFERS VERSUS RELATIVE INCOME

REGION	O.L.S.		I.V.		S.U.R.	
	β_{TR} (s.e.)	R^2 [s.e.]	β_{TR} (s.e.)	R^2 [s.e.]	β_{TR} (s.e.)	R^2 [s.e.]
NENG	-.230 (.0818)	(.54) [.0136]	-.212 (.0883)	(.54) [.0136]	-.262 (.0629)	(.53) [.0137]
MATL	.246 (.1259)	(.37) [.0140]	.269 (.1343)	(.37) [.0140]	.222 (.0649)	(.37) [.0140]
SATL	-.999 (.1401)	(.88) [.0095]	-1.299 (.2001)	(.84) [.0108]	-1.019 (.0912)	(.88) [.0095]
ENC	-.368 (.1392)	(.93) [.0116]	-.355 (.1523)	(.93) [.0116]	-.313 (.0664)	(.93) [.0116]
ESC	.126 (.1723)	(.68) [.0127]	.197 (.1866)	(.68) [.0128]	.053 (.1129)	(.68) [.0128]
WNC	-.585 (.0702)	(.90) [.0054]	-.600 (.0817)	(.90) [.0054]	-.529 (.0474)	(.90) [.0055]
WSC	-.018 (.1026)	(.45) [.0206]	.007 (.1157)	(.44) [.0207]	-.041 (.0806)	(.44) [.0207]
MTN	-.708 (.1426)	(.94) [.0122]	-.778 (.1576)	(.94) [.0123]	-.618 (.0860)	(.93) [.0123]
PAC	-.591 (.3808)	(.38) [.0190]	-1.418 (.6725)	(.88) [.0218]	-.595 (.0918)	(.91) [.0190]
RESTRICTED (1)	-.181 (.0409)	--	-.171 (.0458)	--	-.192 (.0217)	--
P-VALUE	.00		.00		.00	
RESTRICTED (2)	-.327 (.0424)	--	-.306 (.0472)	--	-.266 (.0211)	--
P-VALUE	.00		.00		.10	

Notes to Table 4: The dependent variable is the log of the real relative transfers from the Federal Government. See also Notes to Table 3.

TABLE 5: AVERAGE REAL INCOME, TAXES, TRANSFERS AND DISPOSABLE INCOME

REGIONS	AVG. Y	AVG. TX	AVG.TR	AVG. YD
NENG	10960	2914	1917	9963
MATL	10879	2936	2140	10056
SATL	9580	2389	1746	8937
ENC	10282	2712	1680	9250
ESC	7602	1880	1680	7398
WNC	9790	2446	1707	9051
WSC	9162	2412	1523	8273
MTN	9470	2330	1652	8792
PAC	11336	2839	2026	10523
US	10094	2607	1811	9138

Note to Table 5: The sources of the data are explained in Section 3 in the Text. The Tax variable has been adjusted for the missing Corporate Taxes and indirect taxes and custom duties which, as discussed in the text, represent about 20% of federal taxes over the sample period considered.

TABLE 6: CHANGES IN TAXES AND TRANSFERS DUE TO A 1 DOLLAR SHOCK TO INCOME

METHOD	λ_{TX} dollars	λ_{TR} dollars	$\lambda = 1 - \lambda_{TR} + \lambda_{TX}$ dollars
OLS	.34	-.03	.62
	(.35, .33)	(-.05. -.02)	(.59, .65)
IV	.35	-.03	.62
	(.36, .34)	(-.05. -.01)	(.58, .60)
SUR	.34	-.03	.62
	(.36, .33)	(-.04. -.03)	(.60, .64)
WOLS	.33	-.06	.61
	(.35, .30)	(-.07. -.04)	(.57, .65)
WIV	.35	-.06	.59
	(.37, .33)	(-.07. -.03)	(.56, .63)
WSUR	.34	-.05	.61
	(.36, .33)	(-.06. -.04)	(.59, .63)
INDIVIDUAL REGIONS ESTIMATES OF λ (ols)			
NENG	.34	-.04	.62
MATL	.38	.05	.67
SATL	.43	-.23	.38
ENC	.36	-.06	.58
ESC	.34	.04	.69
WNC	.40	-.10	.50
WSC	.35	-.00	.65
MTN	.31	-.14	.55
PAC	.13	-.25	.62
AVERAGE	.34	-.08	.58

Note to Table 6: λ_{TX} measures the fall in federal taxes that follow a one dollar reduction in a region's total income ($\lambda_{TX} = \beta_{TX} * TX/Y$). Thus, .34 means that when a region's income falls by one dollar, the tax payments from that region to the Federal Government go down by 34 cents. λ_{TR} measures the increase in transfers from the Federal Government that follow a one dollar reduction in a state's income per capita ($\lambda_{TR} = \beta_{TR} * TR/Y$). Thus -.06 means that when a region's income per capita falls by one dollar, transfers from the Federal Government to that region increase by 6 cents.

The first few rows display the λ's associated with the restricted β's from Tables 3 and 4. OLS, IV and SUR correspond to the restricted OLS, Instrumental Variables and SUR systems. WOLS, WIV and WSUR correspond to the restricted weighted OLS, IV and SUR systems. In parenthesis the λ's associated with two standard deviations from the corresponding point estimate for β.

The last few rows display the regional λ's corresponding to the unrestricted unweighted IV systems. The average is the unweighted average of all the λ's above.

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Endnotes

1 See Hartland (1949), Lerner (1951), Meade (1957).

2 The phrase "optimum currency area" was coined by Mundell in his classic (1961) paper.

3 John Stuart Mill, "Principles of political economy" vol. II, New York 1894, page. 176.

4 Although they did not use the phrase "optimum currency area" the concept of unique currency for regions with high labor mobility was already outlined by both Lerner (1951) and Meade (1957).

5 From a Keynesian perspective therefore, the question of the appropriate exchange rate regime cannot really be separated from the debate question the importance and causes of nominal rigidities. Of course the existence of nominal rigidities is at the very heart of the current macroeconomic debate. See Blanchard (1990) for a survey.

6 Other criteria mentioned in the literature are "the degree of openness" (if marginal propensity to import, is very high, a small decrease in income in A and a small increase in B will restore equilibrium); the size of transaction costs (a unique currency reduces the transaction costs and accounting costs); the extent of financial market integration (high capital mobility would facilitate borrowing and lending; of course that would not help with a permanent shift in preferences but it would certainly be very important if the perturbations were temporary). We will not discuss them because we think that (at least in 1992) Europe will satisfy the two requirements

Finally, some economists (Kenen 1969), argue that open economies should have fixed ER only if they have a variety of exports. If an economy exports only one good, then a single shock may require a major real adjustment.

[7] The debate over fixed versus flexible ER does not stop in the analysis of "what kind of shocks are you more likely to suffer". Some of the current debate stresses the "disciplinary" factors of having fixed ER (Giavazzi-Pagano (1988), Giavazzi-Giovannini (1988) and Canzoneri-Henderson (1989)). These researchers use a Barro-Gordon (1983) type of model to stress that the existence of fixed ER increases the anti-inflationary reputation of a single government and, therefore, reduces the real costs of an deflationary policy. For a criticism see Obstfeld (1988).

[8] The way this problem has been handled up to now in the EMS has been through devaluations. There have been 11 episodes of realignment in the 10 years of EMS existence (Giavazzi 1989).

[9] Kenen (1969) was the first to use this kind of argument.

[10] Hartland (1949) analyzes the implicit interregional transfers within the US. She looked at the treasury fund movements from industrialized to agricultural regions in response to the government policy of supporting farm prices in the 1930's. She concludes that "the most important determinant in the maintenance of regional balance of payments equilibria in this country has been the mobility of productive factors, especially that of capital". The argument is that the role of the government was not to carry out the actual transfers but to facilitate private capital movements. See also the Reply by Fels (1950) and Hartland (1950).

[11] The issue of convergence across U.S. states and European regions is studied in Sala-i-Martin (1990), Barro and Sala-i-Martin (1991a and b). Sala-i-Martin (1990) also studies the role of the U.S. Federal Government in promoting regional convergence.

[12] See Eichengreen (1991) for a discussion of this topic.

[13] An even better division would be the "Federal Reserve District" one, which involves 12 Federal Reserve Districts. The tax and transfers coefficients we estimate here, however, are not sensitive to the choice of region. Mulligan and Sala-i-Martin (1991) use 12 Federal Reserve regions in a paper that studies the interplay between money and output in a system of irrevocably fixed exchanges rates.

14 The missing proportion is a little larger for the beginning of the sample: about 25%. The income tax receipts have remained more or less constant over the sample.

15 All the systems allow for each region to have its own constant and time trend.

16 The Pacific region is once again an exception with β_{TX}=.535 (s.e.=3315). Its large standard error, however, implies (as we will see in a second) that its OLS estimate is not significantly different from the rest since we cannot reject the hypothesis of equality of β_{TX} across regions.

17 The average marginal tax rate in the United States has fluctuated over the sample. It was 27% in 1970 and progressively increased until it reached a maximum of 38% in 1981. The Reagan tax cuts brought it back down to 34% by 1985. See Barro (1990) for a discussion of these numbers.

18 The results where the following NENG=-.329 (s.e.=.052), SATL=-.202 (s.e.=.034), MATL=-.404 (s.e.=.041), ENC=-.117 (s.e.=.032), ESC=-.770 (s.e.=.063), WNC=-.480 (s.e.=.030), WSC=-.225 (s.e.=.037), MTN=-.210 (.056), PAC=-.378 (s.e.=.036)